

WHAT IS CLAIMED IS:

1. A method for making a zeolite, comprising the steps of:

a) providing a porous inorganic oxide;

5 b) impregnating said porous inorganic oxide with a liquid solution containing a micropore-forming directing agent, wherein the amount of liquid solution is no more than about 100% of the pore volume of the inorganic oxide, and the concentration of the micropore-forming directing agent in the liquid solution ranges from about 21% to about 60% by weight; and,

10 c) heating the impregnated porous inorganic oxide at an elevated synthesis temperature for a duration of time sufficient to form a zeolite-containing product.

15 2. The method of claim 1 further including the steps of washing and then drying the zeolite-containing product.

20 3. The method of claim 1 wherein in the heating step (c) the impregnated porous inorganic oxide is raised to the synthesis temperature in a period of time short enough to preclude the formation of zeolite crystals larger than about 100 nm in size.

4. The method of claim 3 wherein the zeolite in the product has a crystal size of from about 25 to about 100 nm.

5 5. The method of claim 4 wherein the zeolite is zeolite Y.

6. The method of claim 3 wherein the period of time in which the porous inorganic oxide is raised to the elevated temperature is less than about 3,600 seconds.

10 7. The method of claim 3 wherein the period of time in which the porous inorganic oxide is raised to the elevated temperature is less than about 120 seconds.

8. The method of claim 1 wherein the liquid solution is an aqueous solution.

9. The method of claim 1 wherein the micropore-forming directing agent is an inorganic directing agent which provides OH⁻ ions.

20 10. The method of claim 9 wherein the inorganic micropore-forming directing agent is an alkali metal hydroxide or an alkaline earth metal hydroxide.

11. The method of claim 10 wherein the micropore-forming directing agent is sodium hydroxide.

5 12. The method of claim 9 wherein the concentration of inorganic micropore-forming directing agent ranges from about 25% to about 55% by weight.

10 13. The method of claim 9 wherein the concentration of inorganic micropore-forming directing agent ranges from about 45% to about 50% by weight.

14. The method of claim 9 wherein substantially no organic directing agent is present.

15 15. The method of claim 1 wherein the synthesis temperature ranges from about 50°C to about 150°C.

16. The method of claim 1 wherein the synthesis temperature ranges from about 70°C to about 110°C.

20 17. The method of claim 1 wherein the porous inorganic oxide is a silicon-aluminum-oxygen containing compound.

18. The method of claim 1 wherein the porous inorganic oxide has a structure having mesopores and/or macropores.

19. The method of claim 15 wherein the zeolite-containing product is a composite structure retaining the framework morphology of the porous inorganic oxide but wherein at least some of the porous inorganic oxide is converted to crystalline material.

20. A method for making a nanocrystalline zeolite comprising:

a) providing an porous aluminosilicate material having a structure including mesopores and/or macropores;

b) impregnating the aluminosilicate material with an aqueous solution containing from about 25% to about 55% by weight of sodium hydroxide, wherein the amount of aqueous solution is from about 80% to 100% of the pore volume of the aluminosilicate material; and,

c) heating the impregnated aluminosilicate to an elevated synthesis temperature for a duration of time ranging from about 15 minutes to 5 hours to produce a product containing at least 76% zeolite with a crystal size less than 100 nm.

21. The method of claim 20 wherein the product is a composite structure retaining the structure of the porous aluminosilicate but wherein at least some of the amorphous aluminosilicate is converted to the zeolite.

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22. The method of claim 21 wherein the zeolite is zeolite Y.

23. The method of claim 22 wherein the zeolite Y has a crystal size of less than 100 nm and a pore size of from 7 Å to about 8 Å.

24. A zeolite material having a silica-alumina molar ratio of no more than about 10 and a crystal size of no more than about 100 nm.

25. The zeolite material of claim 24 wherein the silica to alumina molar ratio is less than about 6.

26. A crystalline aluminosilicate material having the structure of zeolite X or zeolite Y and a crystal size of no more than 100 nm.

27. The crystalline aluminosilicate material of claim 26 having the structure of zeolite Y and a crystal size of less than about 100 nm.

5 28. The crystalline aluminosilicate material of claim 27 having a silica to alumina mole ratio of less than about 6, and a unit cell size of less than about 25 Å.